1878MNRAS..38..337J

letter must, upon delivery, be countersigned by the Consul of the applicant to prevent mistakes.

The Hon. Secretary of the Treasury has notified the collector of customs of the ports of Boston, Portland, New York, Philadelphia, and Baltimore of the probable arrival of European observers of this eclipse, who will be identified by exhibiting the above letter, so signed and countersigned, to the collectors named. Orders have been issued to them as follows:—

"Upon the arrival at your port of any of the gentlemen mentioned, you will extend all proper facilities for the speedy delivery to them of the professional instruments in question free of duty and charges."

On presenting the same letter, so countersigned, to the agent of the Pennsylvania Railroad Company in New York, Philadelphia, Baltimore, or Washington, a round-trip ticket to Denver and return will be issued to them by the Railroad Company at the rates before named.

From Denver railroad lines extend to points likely to be chosen for observing stations.

JOHN RODGERS.
Rear Admiral, U. S. Navy, Superintendent.

U. S. NAVAL OBSERVATORY,
Washington, February 1878.

The Luminous Spot on Mercury in Transit.

By B. G. Jenkins, Esq.

The attention of the scientific world will be directed on the 6th of May next to an astronomical occurrence of more than ordinary importance—a May transit of the planet *Mercury*, which has not occurred since the year 1845, although three November transits have taken place within the last thirty years.

Within the last 170 years there have been thirteen transits, upon which some observations on the luminous appendages of the planet have been made; but to come nearer to our own time, within the last forty-five years there have been in all six—on May 5, 1832; November 7, 1835; May 8, 1845; November 8, 1848; November 11, 1861; and November 4, 1868. It will be observed that four of these occurred in November, and only two in May. This is important, because the planet is in two opposite points of its orbit in these months—in November being only about five days from perihelion, and in May about ten days from aphelion, in which position it will be on the 6th of May next.

As we have not had a May transit since 1845, when it was only partly visible in this country, and the previous one in 1832 was unsatisfactorily observed, on account of the unfavourable weather, the coming transit will be of more than ordinary

1878MNRAS..38..337J

importance. It will be well in examining the transits to divide them into May transits and November transits, and, having compared them, to see what conclusions can be drawn in regard to the luminous appendages.

In the transit of 1799, which occurred in May, Schröter and Harding at Lilienthal, and Köhler at Dresden, saw a small luminous spot on the dark disk. The spot was not stationary, for Harding saw it change its position, and later in the day Schröter saw it sometimes on one part of the disk, sometimes on another. Other observers saw, not one, but two small spots of a greyish colour.

In the transit of May 1832 Professor Moll observed a spot, the periphery of which was not well defined, but was always situated in the same position, a little south of the centre of the planet, and preceding the centre.

Turning now to the November transits for further evidence of the luminous spot, we find that the transit of 1835 was not visible in this part of the world, and in the three previous ones of which we have some particulars, viz. those of 1736, 1789, and 1802, no mention is made of a luminous spot; but, as will be seen, it does not follow that it did not exist because it was not observed.

In November 1848 one spot was observed of a greyish colour, shading off on all sides from the centre.

In November 1861 Mr. J. W. Jeans saw a slight ashy light on the eastern limit or following the centre of the planet on its way to perihelion.

In November 1868 Mr. Huggins saw a point of light nearly in the centre which had no sensible diameter, but appeared as a luminous point. It was near the centre, a little south, and following the centre. It remained in the same position during the transit.

Mr. Browning, observing this transit, saw near the centre of the planet two bright grey spots close together, both a little south of the centre, one more conspicuous than the other.

So much for the luminous spot. Let us turn to the rings which have been observed round the planet during a transit.

In May 1707 the late Assistant of the then Astronomer Royal saw *Mercury* in transit encompassed by a thick haze or atmosphere.

In the transit of May 1753 a ring was observed round the planet; also in that of May 1786.

In May 1799 a dark or nebulous ring was observed, the tinge being of a violet hue and strongest near the planet. Schröter also saw the ring, the light of which he says was scarcely brighter than the surface of the Sun, but of another colour. Harding did not see it at first, but he did afterwards when he used a lighter shade.

In May 1832 the planet was seen at the Royal Observatory surrounded by a dusky tinge. In this transit also the ring has been described as of "a violet hue, the colour being strongest near the planet."

1878MNRAS..38..337J

This is the sum of our knowledge about the rings round the planet in the May transits, and from it the natural inference appears to be that when the planet is in transit near its furthest distance from the Sun, it is generally surrounded by a dark nebulous ring.

The first November transit in which we have mention of a ring is that of 1736. Professor Moll says Plantade saw the reverse of what he saw in May 1832; so that the ring must have been a bright one.

In 1789 and 1802 rings—probably bright ones—were observed. The transit of 1835 was not visible in Europe; that of 1848 was, however, and many observers saw a bright ring, although Mr. Breen says he did not see any.

In November 1868 Mr. Huggins saw the planet in transit surrounded by an aureola of light, a little brighter than that of the Sun's disk.

Here the weight of evidence appears to be in favour of a bright ring round the planet when near the Sun, which would probably be the case. It should be stated, however, that Prosperin calls the ring of May 1786 a luminous one, and Ljungberg that of November 1802 a dark one; but it must be remembered that the ring of the transit in 1799, which there can be no doubt was dark, nebulous, and of a violet hue, is described by Schröter as scarcely brighter than the surface of the Sun, and of another colour.

Collecting these results and comparing them, it will, I believe, be found:

1st. That in the May transits, when *Mercury* is near its aphelion, the luminous spot is in advance of the planet, preceding the centre; in the November transits, when *Mercury* is near its perihelion, the luminous spot follows the planet.

2nd. The luminous spot has never been seen at the centre, but always south of it, and therefore cannot be due to diffraction, as Professor Powell suggests.

3rd. Sometimes in the same transit two spots have been seen close together, where shortly before only one was observed.

4th. In the May transits the rings round the planet were dark or nebulous and of a violet tinge; in the November transits they were bright.

5th. If we take the two transits which have received the most careful observation, the May transit in 1832, observed by Professor Moll, and the November transit in 1868, observed by Dr. Huggins, we find the contrast very great and very typical: in the one case a diffused spot preceding the centre, with dark ring surrounding the planet, in the other a sharply defined spot following the centre, with bright ring surrounding the planet.

6th. From all which I conclude that on May 6 next, when *Mercury* will be at almost its furthest distance from the Sun, the luminous spot will not be a point of light having no sensible diameter, but rather diffused, with a periphery not well defined,

1878MNRAS..38..340J

gradually sinking from a greyish white to the dark colour of the disk, situated a little in advance of the centre and to the south of it, and that the planet will be surrounded by a dark nebulous ring, not a bright one.

4 Buccleuch Road, Dulwich,
March 25.

Early Transits of Mercury. By the Rev. S. J. Johnson.

On occasion of the transit of *Mercury* in 1861 I found the planet distinctly perceptible on the Sun with an old ship glass carrying a power of 16. Between the introduction of the telescope in the year 1610 and Gassendi's observation in 1631 three transits of *Mercury* took place, each of which was more or less visible to Europe. These were

1615	May 3	Ingress about $6\frac{1}{2}^{h}$ morn.	Egress about $1\frac{1}{2}^{h}$ aftern.
1618	Nov. 4	" " $11\frac{1}{2}$ morn.	"
1628	May 5	" " $2\frac{1}{4}$ aftern.	"

As many telescopes at this period were probably twice as powerful as the glass I have referred to, is it not possible there may be diagrams of Sun-spots extant showing the little round speck of *Mercury*? Galileo's *Macchie Solari* gives several solar spot diagrams for 1613. Scheiner's *Rosa Ursina* contains several for the year 1625, but there are no doubt other works giving the like.

A year before Horrox obtained a successful observation of a transit of *Venus* he looked unsuccessfully for one of *Mercury*. As this is not referred to in any popular modern work, his words may be given:—

"1638, Octob. 20.—Paulo post ortum solis vidi, per telescopium maculas duas in sole, easdem vidi meridie et diebus sequentibus. At *Mercurium* non vidi. Ex calculo Lausbergii fuisset *Mercurius* in centro Solis horâ 5 manè.

Octob. 21.—Manè. Nullum vidi *Mercurium* in sole, ergo *Mercurius* vel ob latitudinem non ivit sub Solem, vel fuit conjunctio nocte præcedente: flavit enim ventus insolitâ violentiâ. Calculus Rudolphinus facit conjunctionem horâ 11·47′ quâ ego non observavi. Observatio autem Gassendi A.C. 1631 Octob. 28 probat conjunctionem fuisse citiùs per horas 4·43. Ergo vera conjunctio fuisset horâ 7·4′ paulo ante ortum Solis: at statim post ortum Solis nihil visum. Ergo latitudo *Mercurii* major erat semidiametro Solis. Quod etiam probat Gassendi observatio." (*Catalogus observationum Jeremiæ Horroccii*, 1672).

Horrox was at Toxteth at the time, before he went to Hoole. His failure does not appear to have been from insufficient telescopic